Validator™
8" and 10"

Service Manual

Pelton & Crane

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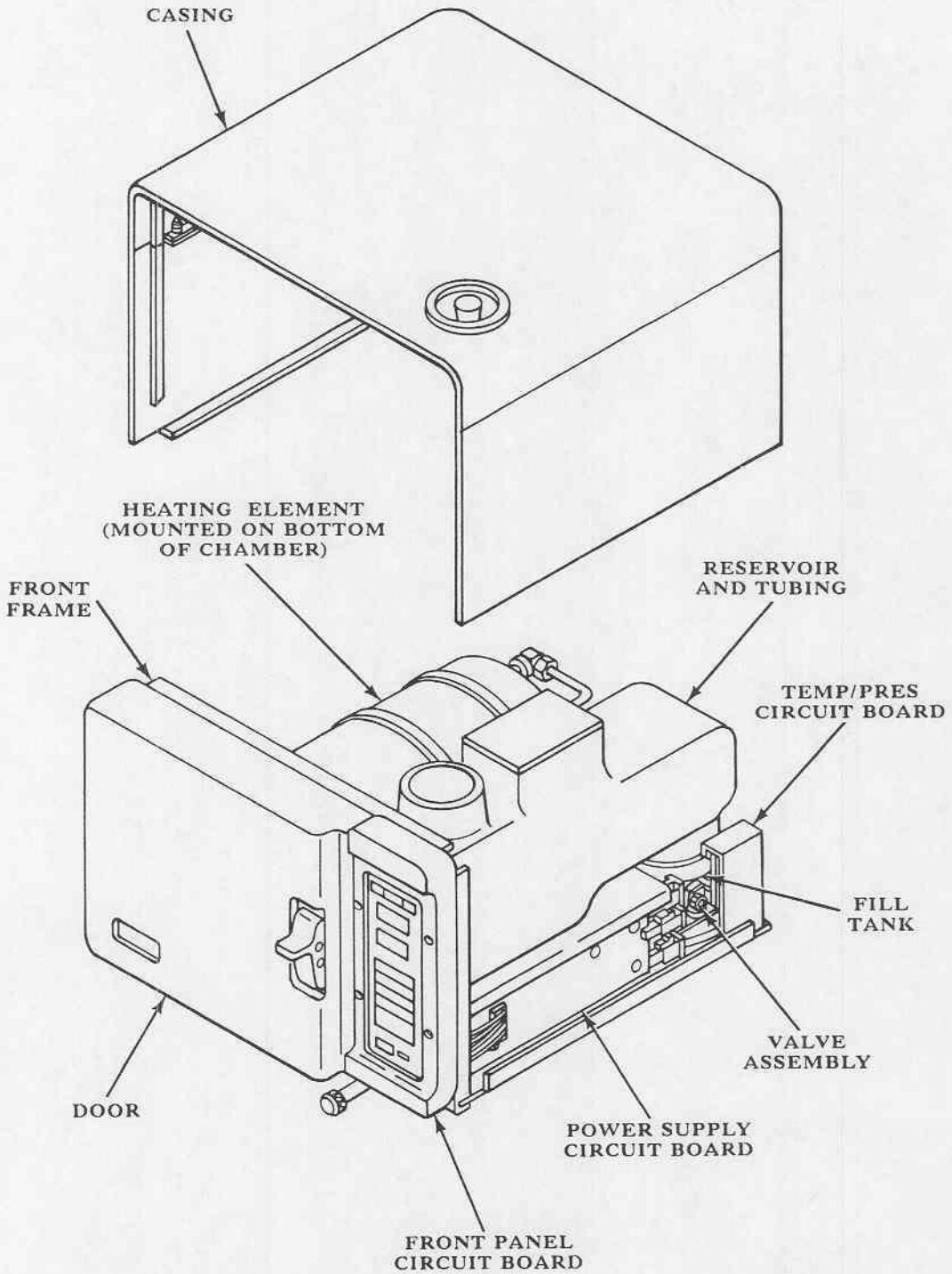
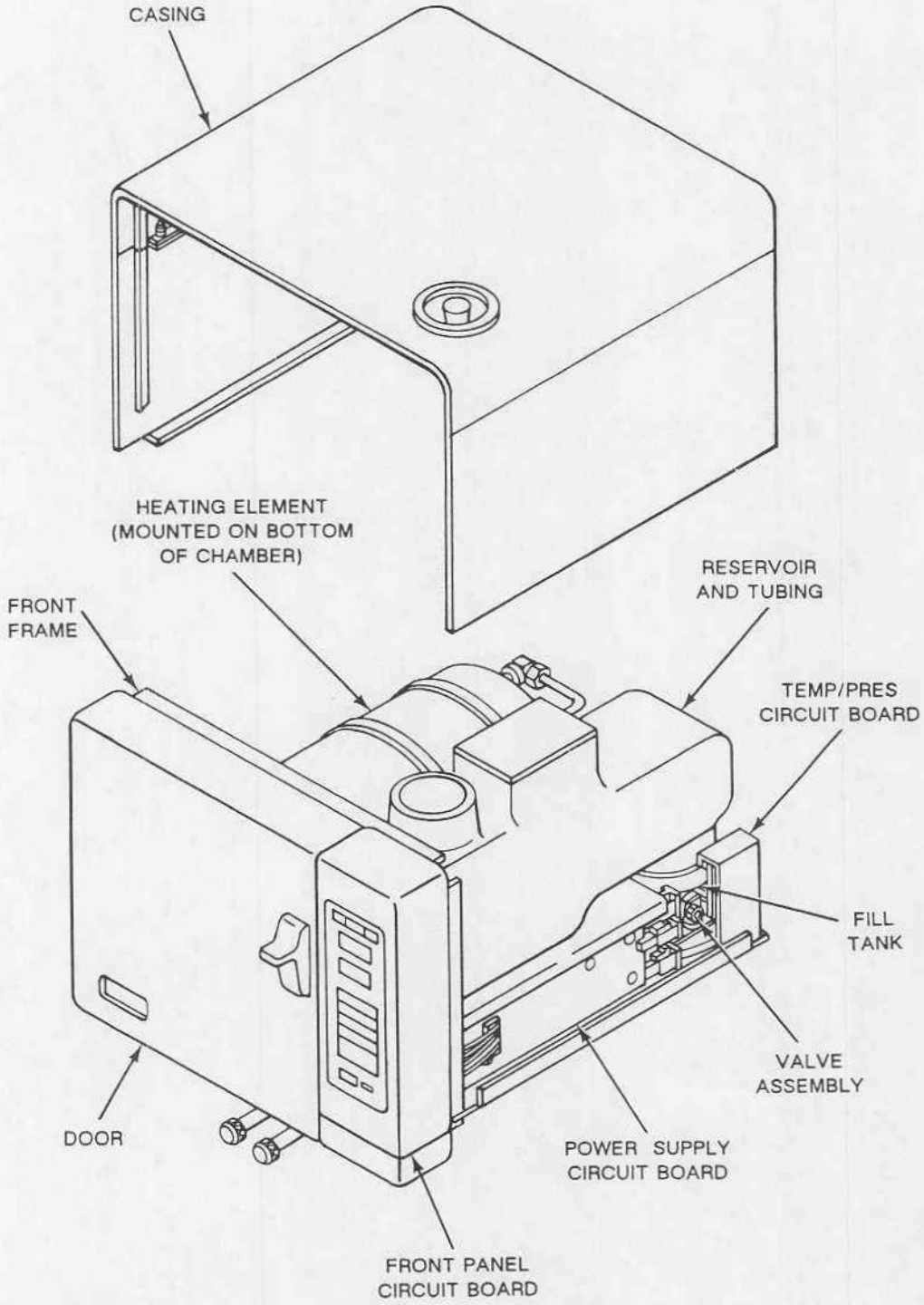


VISUAL INDEX - 8″ MODEL



VISUAL INDEX – 10″ MODEL

SECTION 1 - INTRODUCTION

Fundamentally, the Validator operates under the same principles as other Pelton & Crane autoclaves:

- Steam sterilization cycles at 250°F (121°C) or 270°F (132°C);
- Stores water in a reservoir and condenses steam back for reuse after each cycle;
- Uses air bellows to maintain saturated steam in the chamber;
- Meets requirements (like the Pelton & Crane OCR+ and Magna-Clave) of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code which specifies materials and construction practices for safety of chambers containing pressurized gases.

In spite of these basic similarities, the Validator is different because of its many **new** features. The most obvious new feature is the microprocessor inside, which controls most of the Validator's functions. The valves, the fill cycle and the sterilization timing are all handled automatically. Most of the plumbing connections are made in a valve block where solenoids are attached. Temperature and pressure are shown on digital displays which give greater resolution than analog gauges. These displays show metric units (degrees centigrade and kPa) according to new ADA recommendations. A conversion chart which shows the relationship of these units to previous engineering units is shown in Section 8, **Figure 10**, page 22.

Several standard features of the Validator are also made possible by the microprocessor:

- Self-test of hardware;
- Error display which tells the reason the unit will not sterilize;
- Heater turns off when drying cycle is complete.

In addition, innovative hardware features make the Validator an improvement over traditional Pelton & Crane autoclave designs. These features include:

- A plastic reservoir which will not leak or corrode;
- A separate fill tank which gives a premeasured volume of water for each cycle (eliminating operator errors in filling the chamber);
- A highly reliable one-piece insulated commercial heating element which is temperature controlled for correct sterilization and drying temperatures;
- Chamber which is a one-piece stainless steel deep drawn part, formed from one blank without seams.

SECTION 2 - THEORY OF OPERATION

The Validator is a fully automatic autoclave, which allows an operator to select one of four functions (WRAPPED, UNWRAPPED, PACKS and LIQUIDS) for sterilization. The Validator's microprocessor automatically selects cycle time, temperature and pressure. When the operator presses the CLEAR/START button, the chamber automatically fills with distilled water from the reservoir. When the filling period is complete, automatic activation of the heating element builds temperature and pressure for the desired sterilization function. As the temperature in the Validator rises above 100°C, the air in the chamber is released by the bellows (air valve). When steam contacts the bellows, the bellows expands and seals the chamber. At this point, the chamber is saturated with steam and pressure starts to build. At 132°C and 210 kPa, (WRAPPED and UNWRAPPED cycles) or 121°C and 128 kPa, (PACKS and LIQUIDS cycles) timer countdown begins. If the pressure drops below 206 or 124 kPa, the timer stops countdown until the pressure rises above 206 or 124 kPa. If the timer does not resume countdown within three minutes, the Validator automatically aborts the cycle. (For further information on general theory of autoclave operation, refer to Theory of Operation Autoclaves, YL3-097262.)

The Validator has four preset audible signals. A single beep indicates the beginning of the self-diagnostics routine or the selection of a programmed sterilization cycle. Five continuous beeps indicate the beginning of the drying cycle. After completion of the drying cycle, the Validator beeps 10 times. Continous beeps for one minute indicate an alarm.

The 8" Validator has overall dimensions of 17-1/2" (44.5 cm) wide x 19-1/2" (49.5 cm) deep, add 1" (2.54 cm) to include door handle in depth, x 12-1/4" (31.1 cm) high. The approximate weight of the 8" Validator is 72 lbs. (32 kg), 80 lbs. gross (36 kg).

The 10" Validator has overall dimensions of 19-1/4" (48.9 cm) wide x 23-5/8" (60 cm) deep, add 1" (2.54 cm) to include door handle in depth, x 14" (35.6 cm) high. The approximate weight of the 10" Validator is 95 lbs. (43 kg), 100 lbs. gross (45 kg).

SECTION 3 – FUNCTIONAL DESCRIPTION OF COMPONENTS

Door Lock: The door locking mechanism prevents opening of the door while the unit is pressurized. When the internal pressure equals atmospheric pressure, the door may be opened.

Safety Valve: The safety valve, located on the top rear of the chamber, serves as backup protection in case of overpressure in the chamber. The safety valve opens only if chamber pressure exceeds 241 kPa (34.9 psi).

Bellows and Valve Block Assembly: When water boils in the chamber, steam forces air out through the air valve. At room temperature, the air valve is open. But as steam reaches the valve, the bellows expands and the valve closes. (If the valve did not close, water would boil away and the chamber metal would overheat. If the air valve stayed closed or closed prematurely, air trapped inside the chamber could cause overpressure or improper sterilization.) Refer to **Figure 9**, page 22.

Reservoir Assembly: The reservoir assembly holds water for filling the autoclave chamber. The assembly is also used as a heat sink to condense chamber steam back into water for reuse in the next cycle.

- Metal Fill Tank: The metal fill tank measures the water that will fill the chamber for the sterilization cycle. At the beginning of the sterilization process, the plunger at the base of the fill reservoir opens for one minute, then closes. This allows the measured amount of water for sterilization to run into the chamber.

- Condensing Coil: The condensing coil converts steam coming from the chamber back into water for use in a later cycle.

Heating Element: The heating element allows for even heating of the chamber. The power level is microprocessor controlled for preheat, sterilization and drying. When the unit is turned on, it begins to preheat to minimize the warm–up time for the first cycle. When a cycle is initiated, the heater operates at full power until the steam temperature approaches the value for the selected cycle. Power is then modulated on and off to keep the chamber at the correct temperature. The heater shuts off at the completion of the drying cycle when END is displayed.

Microprocessor/Front Panel Printed Circuit Board: The Microprocessor/Front Panel Printed Circuit Board, located underneath the front cover, contains the microprocessor, displays and control pushbuttons.

Power Supply Printed Circuit Board: The Power Supply Printed Circuit Board generates all required power supplies, and includes the relays for the AC line and the driver circuitry for the heater and solenoids. It is located on the right side of the Validator underneath the Plastic Reservoir. The heater light emitting diode (LED) is illuminated as power is applied to the heater element. The overheat protector LED is illuminated only if the overheat protector switch opens due to overheating. Refer to Section 7, **Figure 5**, page 16.

Temperature/Pressure Sensor Printed Circuit Board: The Temperature/Pressure Sensor Printed Circuit Board is located on the inside right rear of the Validator, and monitors pressure and temperature inside the chamber. The Pressure Sensor is located on the Printed Circuit Board. The Temperature Sensor is located in the tubing near the rear of the chamber. The Temperature Sensor and Board are marked with a calibration code which ranges from 580 to 620. If the Temperature Sensor and Board have calibrations which do not match, the Validator will not operate properly.

SECTION 4 - NORMAL CYCLE

After loading the Validator, close the door, select the proper mode and press CLEAR/START. The unit will display FILL as water runs in from the fill tank. After filling, the lower display shows the temperature again. The heater turns on full power to start chamber warm-up and pressure build-up. Pressure should start to build at about 100°C.

Once the sterilization cycle begins, it is controlled by the pressure value. (This differs from other Pelton & Crane autoclaves, which are controlled by temperature.) If the pressure value initially overshoots, it will stabilize during the cycle unless a problem (such as a defective air valve) causes instability. The sterilization timer is shown on the lower display. Normally, the timer counts down the specified time. If stability problems occur, the timer pauses, since it only counts down while pressure is above a minimum value. A FAIL alarm will occur if the cycle pauses more than three minutes because of a decrease in pressure.

At the end of the sterilization time, the Vent Solenoid opens to lower chamber pressure. When the pressure drops to 20 kPa, the Dump Solenoid opens to aid in speeding the pressure drop to zero. (The LIQUIDS cycle is an exception. This cycle cools down without venting to prevent the liquids from boiling over from a sudden pressure drop.) At this point, the drying cycle begins. A nominal 30 minute length of time is programmed to provide adequate drying for a fully loaded Validator (with the door closed). If the door is opened, loads will dry in approximately five minutes. To start another load, depress CLEAR/START to end the drying cycle and initiate the sterilization process again. The heater power shuts off when the unit flashes END after the drying cycle.

Table 4-1. VALVE ACTUATION

	OPERATION MODE				
SOLENOID	FILL	STERILIZE	VENT	DUMP	OFF
FILL SOLENOID	OPEN	CLOSED	CLOSED	CLOSED	CLOSED
VENT SOLENOID	OPEN	CLOSED	OPEN	OPEN	OPEN
DUMP SOLENOID	OPEN	CLOSED	CLOSED	OPEN	CLOSED

SECTION 5 - TROUBLESHOOTING PROCEDURES

I. OPERATING ALARMS

During the sterilization cycle, there are five alarms which may occur. The DOOR alarm indicates that the door switch is not actuated, and the door must be closed to start or run a cycle. The WATER (H_2O) alarm means that the temperature at the front bottom surface of the chamber is too hot, presumably because no water is left to boil. The FAIL alarm indicates that satisfactory sterilization could not be completed in the time allotted (45 minutes from start, or pause of more than three minutes during the sterilize portion of the cycle). The FAIL alarm shows the unit could not build or maintain pressure. The PRESSURE (PRES) alarm is illuminated when the displayed pressure reaches 225 kPa. This happens more frequently on initial run-up as the unit tries to satisfy temperature and pressure requirements for the beginning of the sterilize portion of the cycle. The SENSOR (SENS) alarm suggests a problem with the chamber sensor circuit.

All alarms produce "beeps" for one minute (or until the problems are corrected by the operator), and flash alarm display readings in the °C/Min. Window. The alarm display readings are shown until the operator depresses the CLEAR/START button. (The DOOR alarm is cleared if the door is closed.) Refer to **Table 5-1** for possible causes of alarm messages.

Table 5-1. OPERATING ALARMS

DISPLAY	PROBLEM	ACTION
door	Door not fully closed.	Check for proper door closure.
	Door switch not properly aligned.	Remove switch cover plate at bottom right of chamber front. Adjust door switch for more contact with door latch.
	Faulty switch, wire or connection.	Check door circuit for continuity when door is closed. (Door switch cable plugs into power board near front.)
H2O	Insufficient water in chamber.	Add distilled water to reservoir. Check for clogged fill filter. Clean filter in ultrasonic cleaner if required.
	Leak in tubing or valve.	Check solenoid valves and fittings for leaks. (Refer to Figure 1, page 10.)
	Leak in gasket.	Check door gasket for leaks and clean or replace as needed.
	Surface temp. sensor faulty.	Check sensor resistance. Replace if necessary. (Refer to Section 8, page 24, for normal values.)
	Defective air bellows or seat.	Check air bellows and seat in valve block. (Bellows should be straight and not compress at room temperature.)
	Water never enters chamber during fill.	Fill valve defective or stuck closed.
	Water is in chamber after fill, but chamber is dry when opened immediately after alarm.	Debris in fill valve seat has allowed all water to be expelled when pressure increased. Clean valve seat.

Table 5-1. (Cont.)

DISPLAY	PROBLEM	ACTION
FAIL	Insufficient water in chamber.	Add distilled water to reservoir. Check for clogged fill filter.
	Leak in tubing or valve.	Check solenoid valves and fittings for leaks. (Refer to Figure 1, page 10.)
	Leak in gasket.	Check door gasket for leaks and clean or replace as needed.
	Chamber overloaded causing unit to take too long to reach operating temp./pressure.	Check chamber for proper loading and remove packages/articles which may hinder proper steam circulation.
	Defective air bellows or seat.	Check air bellows and seat in valve block. (Bellows should be straight and not compress at room temperature.)
	More than three minute lapse in sterilize countdown due to leak causing more than 4 kPa pressure decrease.	Check valves, fittings and gasket for steam leaks. (Refer to Figure 1, page 10.)
		Check safety valve for seepage at normal operating pressure. Replace if defective.
	No heater power or insufficient heater power.	Overheat protector opening too soon. (Overheat LED is normally never illuminated.)
	Defective heater triac.	Check resistance values. (Refer to Section 8, page 25.)
	Defective heater.	Check resistance values. (Refer to Section 8, page 25.)
PRES	Overpressure in system. Always recheck. If PRES alarm continues, check for mismatched temp. sensor, temp./pressure module.	Clear unit. Restart cycle. Check sensor type number and board calibration code. If unmatched, replace as a set.
	Steam sensor mounted at valve block (only applies for serial numbers 1001 - 1876).	Install sensor relocation kit, #AB9-025008 (available from Pelton & Crane at no charge).
	Defective air bellows cuts off steam flow by temp. sensor, causing erroneous temp. reading.	Check air bellows. (Bellows should be straight and not compress at room temperature.)
	Heater power never cuts back.	Verify heater power LED cuts off as unit reaches desired temperature. Check Triac resistance. (Refer to Section 8, Table 8-2, page 26.) If Triac tests correctly, replace power board.
	Temperature reading does not increase during cycle.	Steam sensor unplugged. Steam sensor wires causing poor connection. Check plug and wiring connections.
		Steam sensor defective. Replace.
		Temp./pressure board defective. Replace.
	Temp./pressure module out of calibration.	If above mentioned actions do not correct problem, replace temp./pressure module and sensor.

Table 5-1. (Cont.)

DISPLAY	PROBLEM	ACTION
SENS	Chamber temp. sensor has faulty connection or is unplugged.	Check wiring connections at plug.
	Defective chamber temp. sensor.	Check resistance. Refer to Section 8, page 26.
	Defective temp./pressure module.	If sensor is functioning properly but SENS alarm continues, replace temp./ pressure module.

II. SELF-DIAGNOSTICS CHECK

The Validator performs a diagnostic self-check on eight key components. To begin the check, depress and hold START/CLEAR switch while depressing and then releasing the POWER switch. The autoclave beeps once, signaling the beginning of the self-diagnostics procedure. Refer to **Table 5-2** for description of tests.

Table 5-2. DIAGNOSTIC SEQUENCE NUMBERS

SEQUENCE NUMBER	CHECK DISPLAY	COMPONENTS CHECKED	OPERATIONAL FUNCTION CHECKED
1	GO/NO	Pressure Sensor	Electrical continuity.
2	GO/NO	Exhaust Steam Temperature Sensor	Electrical continuity. (Will fail if sensor is colder than 20° C. Repeat test after unit warms up.)
3	GO/NO	Chamber Temperature Sensor	Electrical continuity.
4	Blue Display Windows	kPa/°C/Min Displays	All Display segments illuminate for visual inspection. Proper operation is indicated by displays of 8:88 in the kPa window and 8.8:8.8 in the °C/Min window.
5	Panel LEDS	Cycle Indicator Lights Program/Power Indicators	All indicator lights illuminate for visual inspection.
6	GO/NO	Vent Solenoid	Solenoid operation and electrical continuity. (Will pass even if solenoid sticks. Verify plunger actuation.)
7	GO/NO	Fill Solenoid	Solenoid operation and electrical continuity. (Will pass even if solenoid sticks. Verify plunger actuation.)
8	GO/NO	Exhaust Solenoid	Solenoid operation and electrical continuity. (Will pass even if solenoid sticks. Verify plunger actuation.)

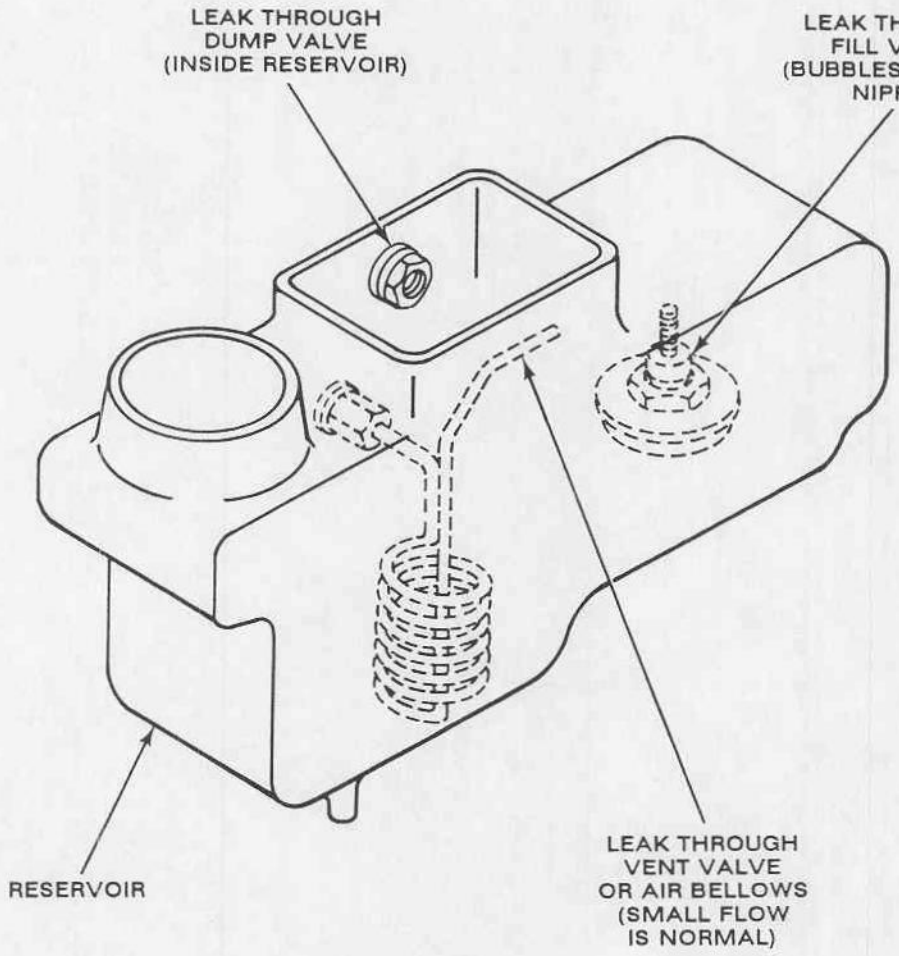


FIGURE 1 – VALVE LEAKS

Table 5-3. USAGE PROBLEMS

PROBLEM INDICATORS	PROBLEM CAUSE	CORRECTIVE ACTION
Mineral buildup on chamber wall or water spots on chamber and contents.	Minerals in water deposit on chamber or on contents.	Clean with Omni-Cleaner. Refill using distilled or clean demineralized water.
Unit takes an excessive amount of time (over 15 to 20 minutes from a warm start) to reach required sterilization temperature.	Load is too large. Steam pushing out air too slowly.	Remove some packages/articles for faster steam flow.
	Faulty bellows.	Replace. Refer to Section 7-XVI, page 20.
	Low power line voltage.	Correct voltage if feasible.
	Leak in valves.	Refer to Figure 1, page 10.
Temperature display remains well below required temperature for cycle.	Air in chamber not totally expelled.	Change bellows.
	Dump valve stuck open.	Check valve seat for debris.
Packs still wet after drying cycle.	Overloaded chamber.	Follow loading instructions.
	Incomplete drying.	During dry cycle, leave door open approximately 1".
	Fill line filter clogged or not properly installed, resulting in too much water remaining in chamber.	Clean filter in ultrasonic cleaner. Adjust fill line to center bottom of chamber.
Wet layer in pack.	Inadequate steam penetration due to tight pack wrapping or condensation from packs.	Inspect pack for proper steam penetration. Basins, kits and other utensils should be prepared as individual packs.
Water collects in bottom of Validator when unit is not in FILL cycle.	Leaking fill valve.	Inspect and clean valve seat and plunger. Replace defective parts if required.
Unit drips on counter when door is opened after cycle.	Possible damage to rubber dam.	Check dam for proper adherence and shrinkage.
Water comes out of fill opening on top of case when unit vents to reservoir.	Reservoir overfilled.	Drain some water. Fill to bottom of opening.
	Cracked condenser tube causing turbulence under fill opening.	Replace condenser tube.
Sterilizer is operating, but fails several self-tests.	Poor cable connections.	Check cable connectors at front panel and power board.
Unit will not turn on.	Power control LED on power board should come on. If not, faulty on/off switch or faulty power board. (Refer to Figure 5, page 16.)	Check power on switch on microprocessor board with ohmmeter for contact closure when depressed.
		Replace power board if switch and cable show proper test.

Table 5-3. (Cont.)

SYMPTOM	TROUBLE	REMEDY
Unit will not change modes.	Switches on board too far behind panel membrane.	Check for flashing or washers causing additional spacing between board and panel. If not correctable, replace panel.
	Defective front microprocessor board.	Replace front microprocessor board.
Unit operates, but displayed temp. and pressure are not in proper units.	Jumpers incorrectly installed on microprocessor board.	Refer to Figure 2.
Dark stains on instruments.	Electroplating.	Do not mix dissimilar metals in the same package. Separate carbon steel, aluminum chrome and brass from stainless steel trays by using a tray liner. (Refer to 8" and 10" Validator Operator's Manual, YL3-097625, Section 2-III.)
	Chlorine stains.	Do not use toweling or packaging which may contain chlorine bleach residue.
Chamber cracks.	Chlorine.	NEVER use chlorine cleansers or materials in chamber. Wrapping materials should not be cleaned with chlorinated bleaches.

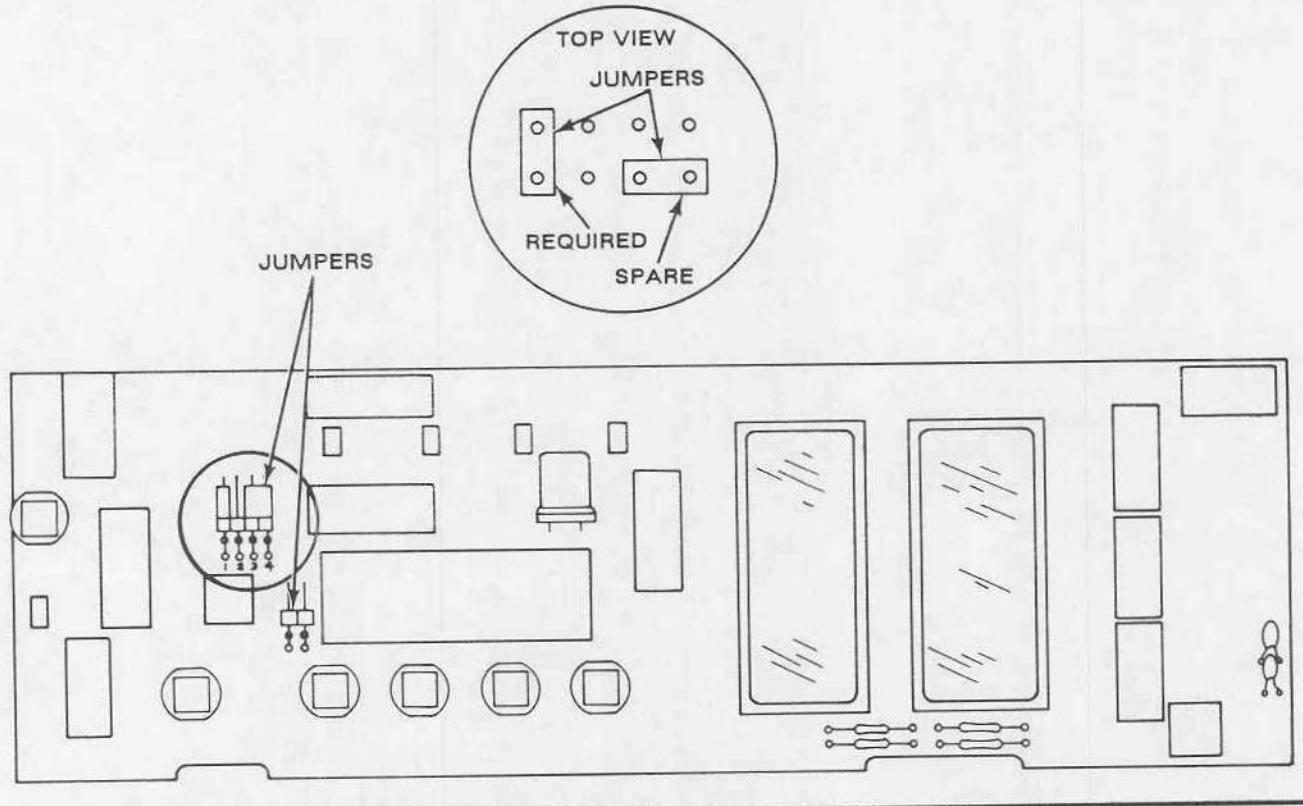


FIGURE 2 - MICROPROCESSOR/ FRONT PANEL JUMPERS

SECTION 6 - GENERAL SERVICE INFORMATION

I. REMOVING AND REPLACING COVER

A. To unfasten cover, remove **only** the two screws at bottom of rear panel.

B. Remove reservoir fill cup and cover assembly. Slide cover to rear. Lift front of cover slightly to clear top of reservoir.

C. When replacing cover, make sure lip of front panel engages in slot along all edges. Reinstall screws and reservoir fill cup and cover assembly.

II. DRAINING RESERVOIR AND FILL TANK

WARNING: Empty reservoir and fill tank before turning unit over for service and before shipping.

A. 8" VALIDATOR

1. On the 8" model, pull the drain tube out from under the front of the autoclave. Drain tube will extend 4" (10.2 cm).

2. Unscrew knurled cap to open tube, and drain reservoir.

3. When draining is complete, replace cap and push the drain tube back under the unit.

4. With power on, perform a fill cycle to empty the fill tank. Push CLEAR/START button. After water runs into chamber, use a sponge to remove water from inside of chamber.

B. 10" VALIDATOR

1. On the 10" model, pull both drain tubes out from under the front of the autoclave. Drain tubes will extend 4" (10.2 cm).

2. Unscrew knurled caps to open tubes and drain reservoir and fill tank.

3. When draining is complete, replace caps and push drain tubes back under the unit.

III. ADJUSTING METAL FILL TANK SUPPORT

A. The Validator's fill solenoid plunger assembly must be in an upright position, well centered in the opening of the reservoir, for proper operation. (To center, align fill tank assembly with solenoid plunger assembly.) Adjust metal fill tank support underneath metal fill tank from side-to-side with allen screw, and from front to back with 7/16" hex bolts on rear bracket. (Refer to **Figure 3.**)

IV. PRINTED CIRCUIT BOARDS

A. Printed circuit boards used in the Validator are not unusually static sensitive. However, damage may occur if printed circuit boards are not handled carefully. Before handling any board, touch a grounded surface to eliminate static charge.

B. There are no user adjustments on the printed circuit boards. All calibrations must be made using special test fixtures at the factory. Unauthorized adjustments are not covered by the warranty.

C. Use static protection bags when storing, shipping or returning boards.

V. SPORE TEST

A. To verify satisfactory sterilization, a biological spore test indicator (Attest® Biological Monitoring system, 3M, St. Paul, MN; Propper, Long Island City, NY,) is recommended inside a representative load after any repair.

VI. LEVELING FEET

A. Adjustable feet are provided on the front of the Validator to compensate for uneven countertops. The unit must be reasonably level to ensure proper draining and water distribution inside the chamber. (Leveling feet are hand adjustable.)

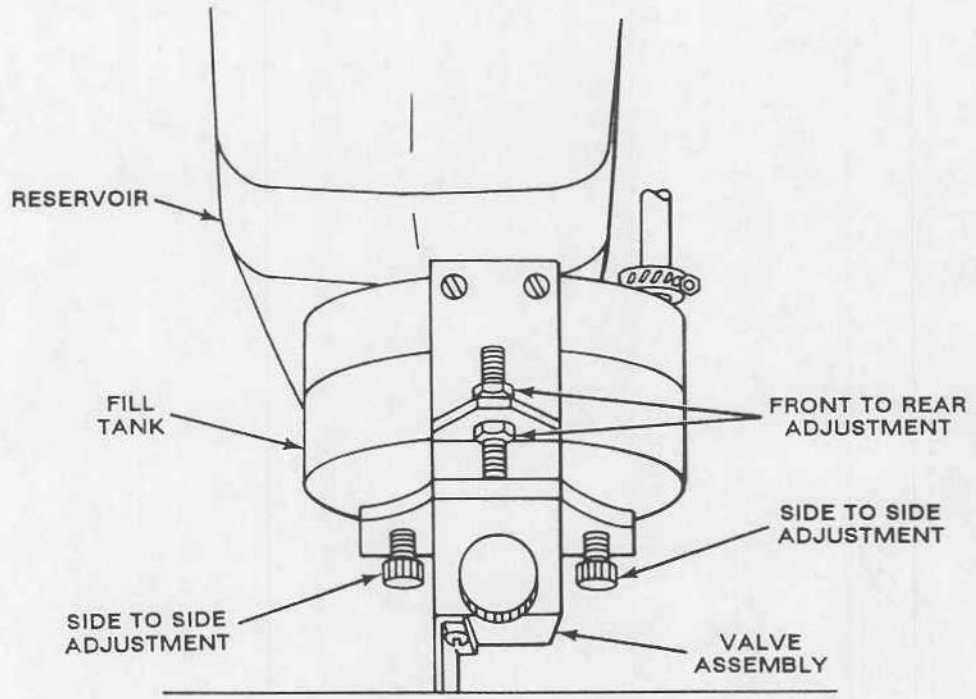


FIGURE 3 - FILL TANK ADJUSTMENT

SECTION 7 – PARTS REPLACEMENT

NOTE: Refer to the 8″ Validator Parts List, YL8–096650, and the 10″ Validator Parts List, YL8–097738, when ordering parts.

I. TEMPERATURE/PRESSURE MODULE PRINTED CIRCUIT BOARD

NOTE: The temperature sensor and the temperature/pressure printed circuit board are a matched set, and must be replaced at the same time when servicing.

WARNING: **Before servicing, disconnect power plug from outlet.**

A. Remove outside cover. (Refer to Section 6–I, page 13.)

B. Disconnect the three cable connectors from the temperature/pressure sensor printed circuit board.

C. Unscrew old temp. sensor (see **Figure 4** for location), and replace with new temp. sensor. Use pipe dope or Teflon tape to prevent leakage at new sensor.

D. Unscrew steam line to pressure sensor at valve block. Remove mounting screws holding temp/pressure sensor printed circuit board to bracket.

E. Remove steam line from rubber tubing.

F. Install new temp/pressure sensor printed circuit board in reverse order of preceding directions.

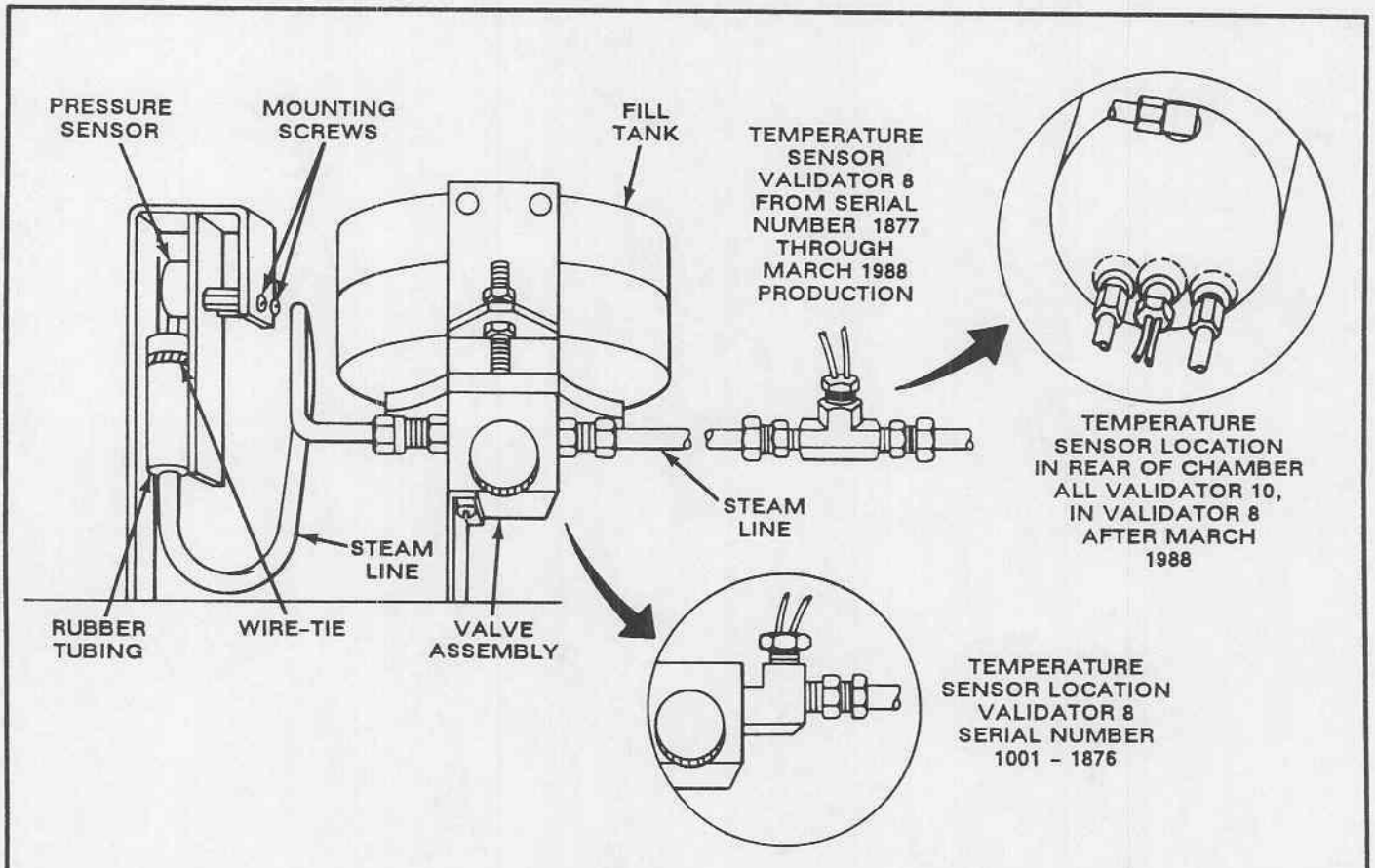

PRESSURE SENSOR
MOUNTING SCREWS
FILL TANK
TEMPERATURE SENSOR VALIDATOR 8 FROM SERIAL NUMBER 1877 THROUGH MARCH 1988 PRODUCTION
TEMPERATURE SENSOR LOCATION IN REAR OF CHAMBER ALL VALIDATOR 10, IN VALIDATOR 8 AFTER MARCH 1988
STEAM LINE
STEAM LINE
RUBBER TUBING
WIRE-TIE
VALVE ASSEMBLY
TEMPERATURE SENSOR LOCATION VALIDATOR 8 SERIAL NUMBER 1001 – 1876

FIGURE 4 – TUBING TO PRESSURE SENSOR, TEMPERATURE SENSOR LOCATION

II. POWER SUPPLY PRINTED CIRCUIT BOARD

WARNING: Before servicing, disconnect power plug from outlet.

A. Remove outside cover. (Refer to Section 6–I, page 13.)

B. Remove screw from top right corner of mount assembly. Remove clear plastic cover from power supply printed circuit board by sliding to the right.

C. Disconnect cables from power supply printed circuit board.

D. Unscrew four phillips head screws to remove old power supply printed circuit board.

E. Reconnect new power supply printed circuit board in reverse order of preceding directions. (Refer to **Figure 5** to install cables.)

III. MICROPROCESSOR/FRONT PANEL PRINTED CIRCUIT BOARD

WARNING: Before servicing, disconnect power plug from outlet.

A. Remove four allen screws fastening microprocessor/front panel printed circuit board.

B. Remove front panel assembly.

C. Disconnect power cable from microprocessor/front panel printed circuit board.

D. Remove six allen screws fastening microprocessor board to front panel.

E. Remove old microprocessor/front panel printed circuit board.

F. Replace and reconnect new microprocessor/front panel printed circuit board in reverse order of preceding directions.

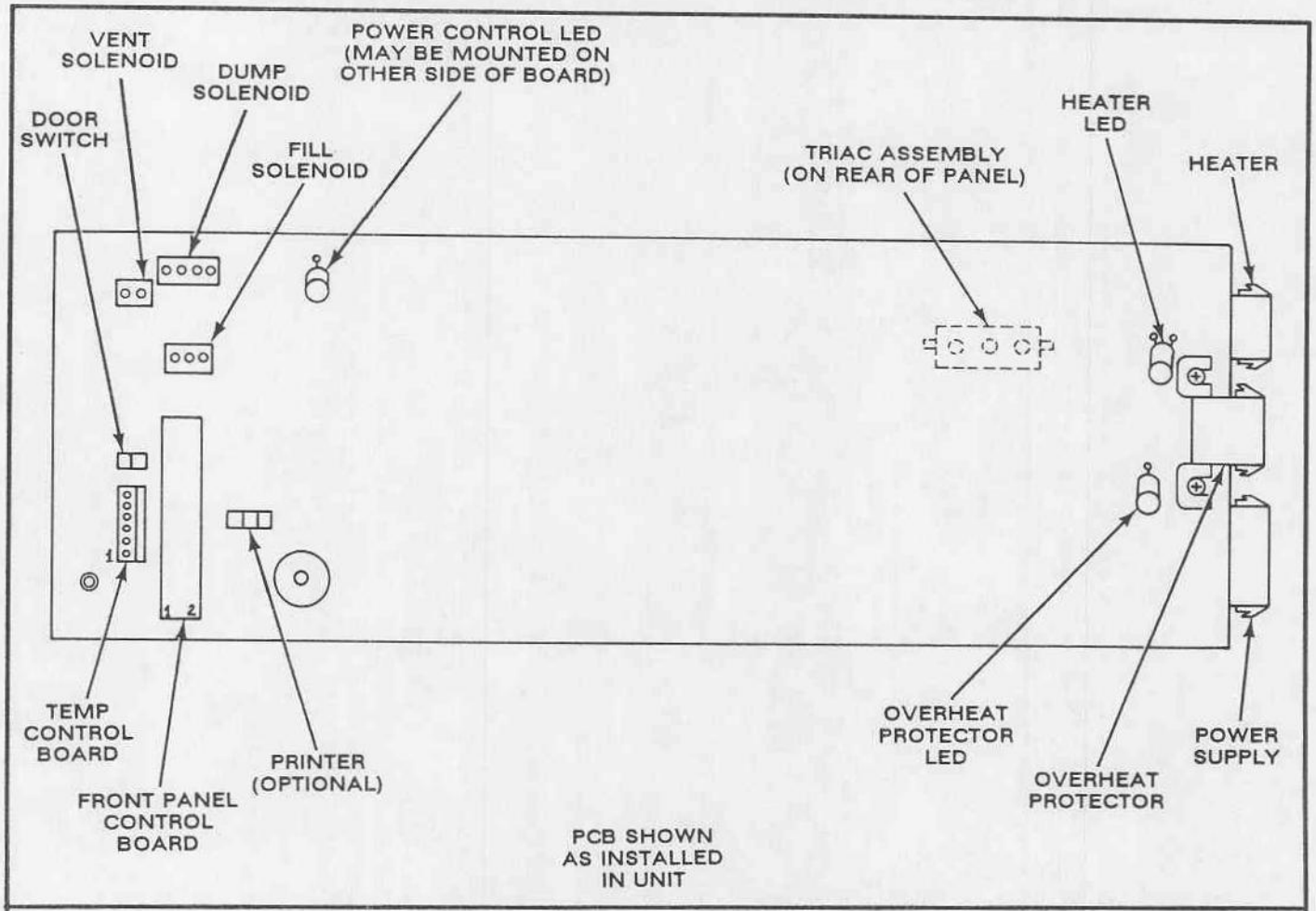


FIGURE 5 – POWER SUPPLY BOARD CABLE CONNECTIONS

IV. PLASTIC RESERVOIR

WARNING: Before servicing, disconnect power plug from outlet.

A. Remove outside cover. (Refer to Section 6–I, page 13.)

B. Drain water from reservoir. (Refer to Section 6–II, page 13.)

C. Disconnect all tubing.

D. Remove condenser coil.

E. Unscrew plunger assembly from inside of reservoir and remove.

F. Remove old plastic reservoir.

G. Replace new plastic reservoir in reverse order of preceding directions.

H. Fill new plastic reservoir with distilled water.

V. METAL FILL TANK

WARNING: Before servicing, disconnect power plug from outlet.

A. Follow steps A–F for replacement of plastic reservoir. (Refer to Section 7–IV.)

B. Remove metal washer.

C. Unscrew and remove fill tank adjustment angle from fill tank adjustment plate.

D. Loosen set screws underneath metal fill tank.

E. Unscrew metal fill tank and remove.

F. Apply LocTite® sealer to metal fill tank threads.

G. Screw in new metal fill tank until it is in lowest position at which square mount aligns with back of Validator.

H. Tighten set screws.

I. Reconnect adjustment angle, adjustment plate and reservoir in reverse order of preceding directions.

NOTE: Metal fill tank must be adjusted so that plunger in plastic reservoir is centered in opening. (Refer to Section 6–III–A, page 13.)

VI. VALVE BODY AND SEAT ASSEMBLY

WARNING: Before servicing, disconnect power plug from outlet.

A. Follow steps A–E for replacement of metal fill tank reservoir. (Refer to Section 7–V.)

B. Disconnect all outgoing tubing from valve body and seat assembly, including tubing going to pressure sensor.

C. Disconnect all solenoid leads from power supply printed circuit board.

D. Remove three round head machine screws fastening valve body and seat assembly to bottom of Validator.

E. Replace valve body and seat assembly. Reconnect new or repaired valve body and seat assembly in reverse order of preceding directions.

VII. FILL SOLENOID

WARNING: Before servicing, disconnect power plug from outlet.

A. Remove outside cover. (Refer to Section 6–I, page 13.)

B. Disconnect solenoid lead from power supply printed circuit board.

C. Unscrew hex nut from bottom of solenoid valve assembly.

D. Remove housing and solenoid coil from valve assembly.

E. Remove stopper from top of plunger rod inside reservoir.

F. Use wrench nut (available from Skinner Valve Division, 95 Edgewood Ave., New Britain, CT, 06051, part no. VO.233 – or equivalent), to unscrew solenoid plunger assembly.

G. Remove solenoid plunger assembly from valve block assembly. Clean valve plunger seat area. Clean seat in valve assembly.

H. Replace solenoid plunger assembly.

I. Reassemble and connect solenoid plunger assembly in reverse order of preceding directions.

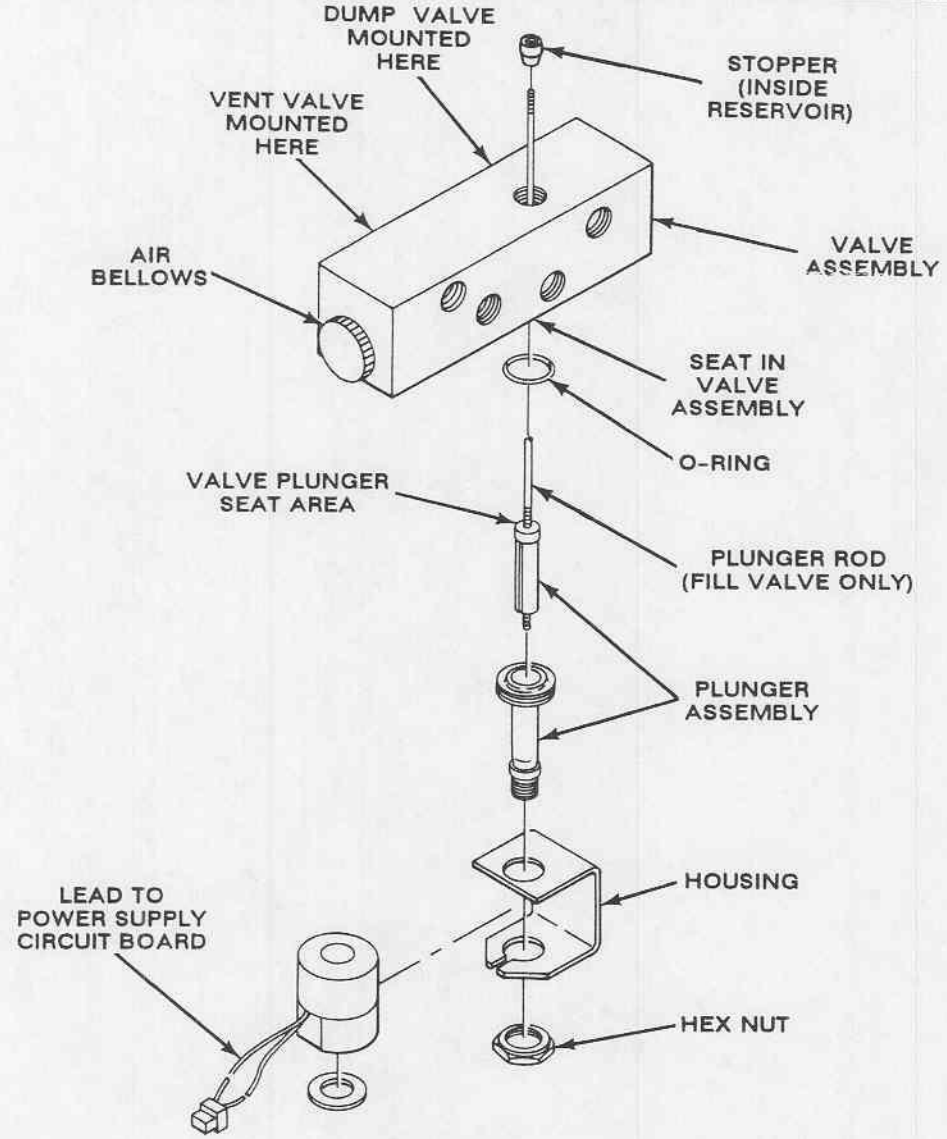


FIGURE 6 - FILL SOLENOID

VIII. DUMP SOLENOID

WARNING: Before servicing, disconnect power plug from outlet.

A. Follow steps A–D and F–H for fill solenoid replacement. (Refer to Section 7–VII, page 17.)

IX. VENT SOLENOID

WARNING: Before servicing, disconnect power plug from outlet.

A. For replacement, follow steps A–D and F–H for fill solenoid replacement. (Refer to Section 7–VII, page 17.)

X. OVERHEAT PROTECTOR AND HEAT SENSOR

WARNING: Before servicing, disconnect power plug from outlet.

A. Remove outside cover. (Refer to Section 6–I, page 13.)

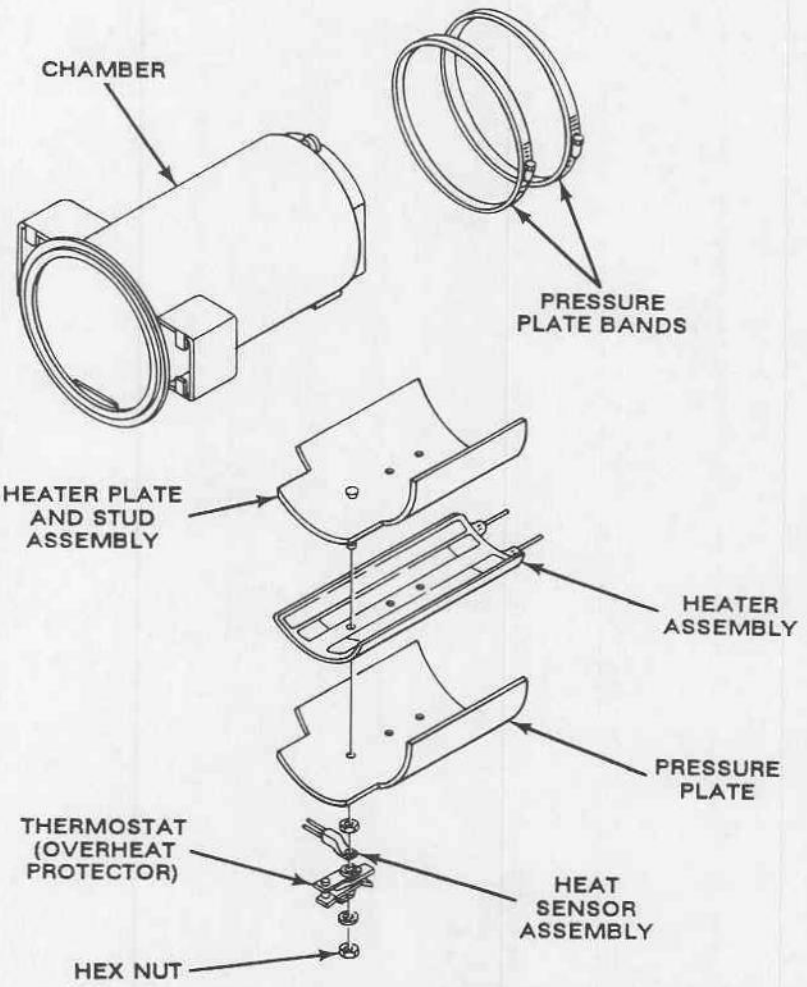


FIGURE 7 – REPLACEMENT OF OVERHEAT PROTECTOR, HEAT SENSOR AND HEATER ELEMENT

B. If changing heat sensor, disconnect heat sensor wire lead from temperature/pressure sensor printed circuit board.

C. If changing overheat protector, disconnect Overheat Protector wire from power supply printed circuit board.

D. Unscrew nut on mounting stud and take off overheat protector. (Remove from underneath unit through opening in bottom pan if replacing.)

E. Remove heat sensor from stud and replace with new heat sensor if required.

F. Hold heat sensor in place and reinstall overheat protector. Secure both parts with nut.

G. Reconnect overheat protector and heat sensor to circuit boards.

NOTE: Overheat protector is factory preset and does not require adjustment. Replace if defective.

XI. HEATER ELEMENT

WARNING: Before servicing, disconnect power plug from outlet.

A. Remove outside cover. (Refer to Section 6–I, page 13.)

B. Remove mounting screws from chamber rear support to pass heater wires underneath.

C. Disconnect heater connections from power supply printed circuit board.

D. Remove overheat protector and heat sensor. Refer to Section 7-X-B through E, page 19.

E. Remove metal straps securing insulation jacket to heater and chamber. Remove insulation. Remove large hose clamps securing copper plates to chamber. (Pressure plate will come free.)

F. Remove heater (located between copper plates).

G. Replace new heating element in reverse order of preceding directions. Install heater with printed information facing **away** from the chamber.

XII. CHAMBER AND DOOR ASSEMBLY

NOTE: Any service to the chamber and door assembly should not be performed in the field. Service and repair of the chamber and door assembly should be performed by the factory only, to assure continued compliance with ASME requirements.

XIII. CONDENSING COIL

WARNING: **Before servicing, disconnect power plug from outlet.**

A. Remove outside cover. (Refer to Section 6-I, page 13.)

B. Unscrew compression nut connecting condensing coil to coupling.

C. Remove condensing coil.

D. Place new compression nut and sleeve over end of condensing coil.

E. Insert new condensing coil into coupling and tighten nut.

XIV. DOOR GASKET

A. Open door to expose gasket.

B. Remove old door gasket.

C. Wipe new door gasket with Omni-Cleaner or ordinary detergent and water.

D. Install new door gasket by starting at bottom of door and working door gasket up into position.

XV. SAFETY VALVE

WARNING: **Before servicing, disconnect power plug from outlet.**

A. Remove outside cover. (Refer to Section 6-I, page 13.)

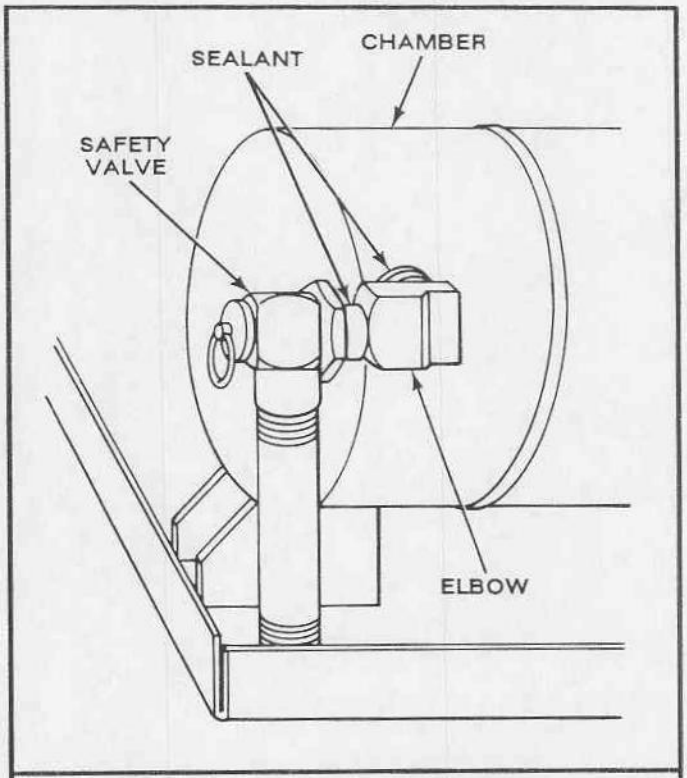


FIGURE 8 - SAFETY VALVE

B. Unscrew safety valve and brass elbow from chamber.

C. Unscrew old safety valve from elbow.

D. Apply fresh pipe thread sealant to elbow and chamber screw threads.

E. Insert new safety valve into elbow and tighten.

F. Reconnect new safety valve in reverse order of preceding directions. Be sure to tighten safety valve and properly align with opening in pan.

XVI. AIR BELLOWS AND CAP ASSEMBLY

A. Turn off power.

B. Unscrew and withdraw bellows and cap assembly.

C. Bellows can be replaced separately or entire assembly may be changed. (The assembly is the same as that used on the Pelton & Crane OCM, OCR and Magna-Clave.)

D. Reassemble air bellows and cap assembly in reverse order of preceding directions.

XVII. SAFETY FEATURES

A. The Validator will automatically shut down for overpressure if the pressure display reaches 225 kPa. If it does not, a mechanical valve will open at 241 kPa.

B. The Validator will not start with the door open. The sterilization cycle will not continue if the door is opened after starting until the door is closed again.

C. The door cannot be opened if 1 kPa is present.

D. The plastic door cover protects the operator from being burned.

E. The heater power shuts off automatically when the drying cycle displays END.

XVIII. PERIODIC MAINTENANCE

NOTE: Proper cleaning at regular intervals is essential, since mineral deposits, debris or trash may cause the unit to malfunction.

A. Normal Chamber Cleaning

1. Drain reservoir and fill tank. (Refer to Section 6–II, page 13.)

2. Mix three ounces (88.7 ml) of Omni-Cleaner per quart (.9 L) and distilled deionized water for a normal cleaning solution. For extremely dirty chambers, solution may be increased to four ounces (118.3 ml) per quart and (.9 L) of distilled or deionized water, and may require three cleaning cycles.

3. Add one quart of cleaning solution to reservoir.

4. Complete one WRAPPED program cycle and one UNWRAPPED program cycle for each cleaning cycle.

   NOTE: Instruments should not be sterilized while cleaning autoclave.

5. At the end of the cycle, drain cleaning solution from reservoir. On the 8″ model, extend tube and drain reservoir. To empty fill tank, push CLEAR/START button. After water runs into chamber, remove solution from inside of chamber using a sponge. On the 10″ model, extend both tubes to drain reservoir and fill tank.

B. Changing Water

1. Drain reservoir.

2. Press CLEAR/START button to empty fill tank into the chamber.

3. Wipe water out of chamber.

4. Pour distilled deionized water into reservoir.

C. Cleaning Exterior Surfaces

1. Clean all exterior surfaces with mild detergent and water. Use a sponge or cloth.

2. Exterior surfaces may be disinfected using an iodophor (Biocide®, Biotrol, Inc., N. Salt Lake City, Utah, or equivalent), glutaraldehyde (Cidex®, Surgicos, Dallas, TX, or equivalent), or sodium hypochlorite (household bleach diluted 1:10–1:100). **Do not** use household bleach on interior stainless steel surface.

SECTION 8 – REFERENCE INFORMATION

(For Validator Wiring Diagram See YL8-097611)

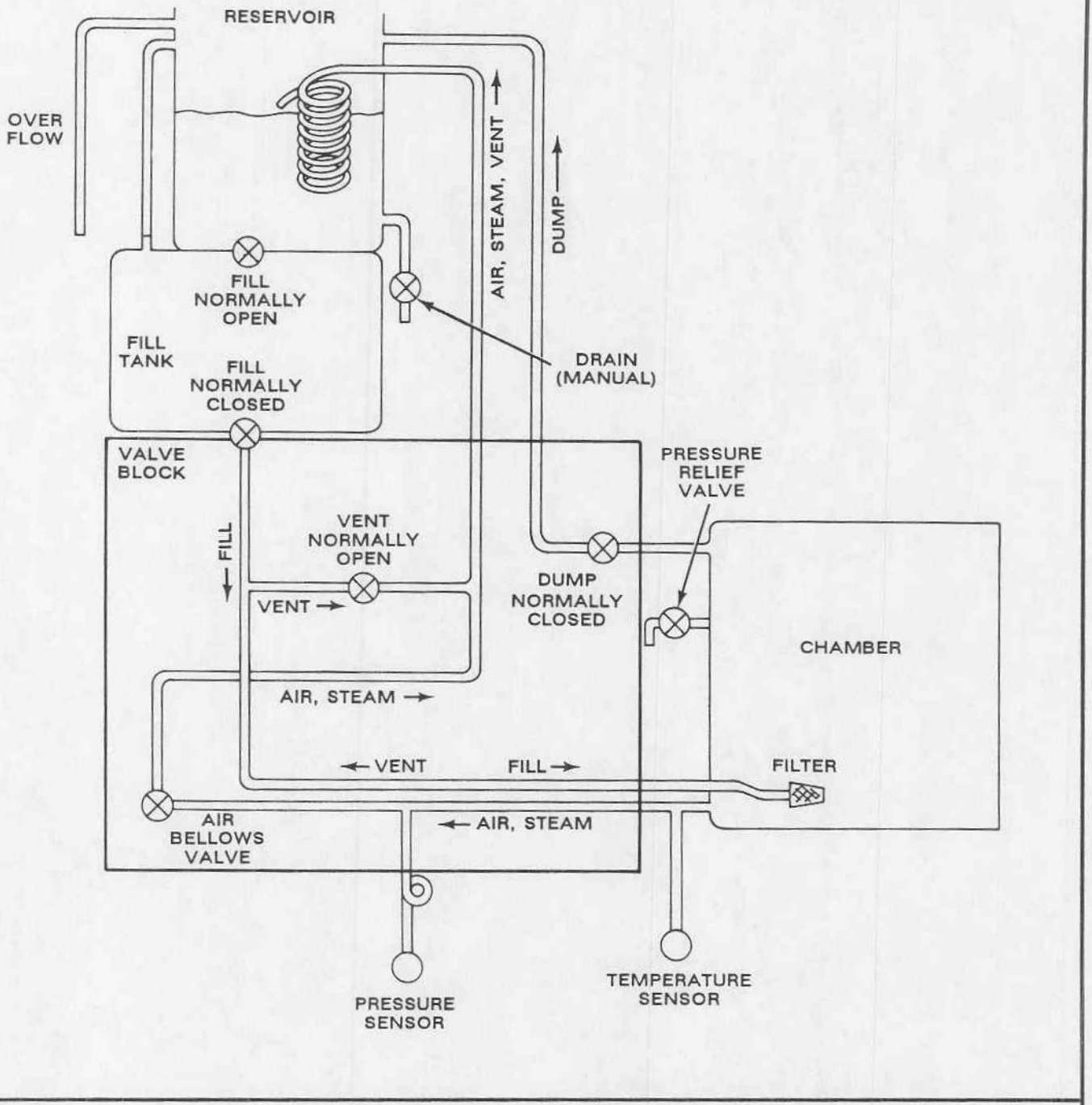


FIGURE 9 – PLUMBING DIAGRAM

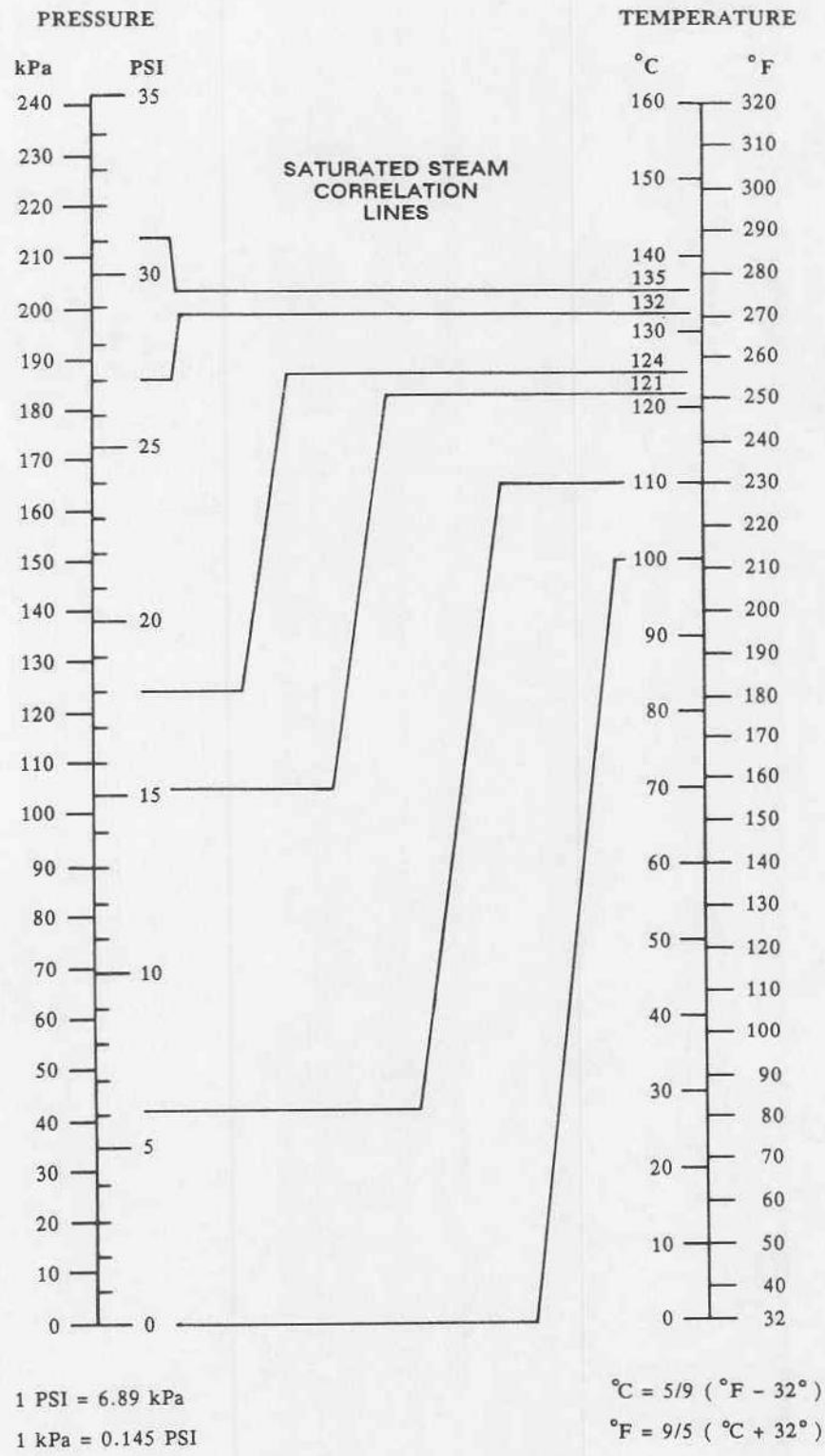


FIGURE 10 - AUTOCLAVE CONVERSION SCALES

Table 8-1. CABLE CONNECTIONS

POWER BOARD

P1 26 Pin Cable to MPU

1	8VDC unregulated	2	Futaba filaments supply
3	Pulses at power line frequency	4	Heater drive input
5	Futaba filaments supply	6	Solenoid voltage sense
7	GND	8	GND
9	GND	10	N/C
11	24VDC	12	24VDC
13	5VDC	14	5VDC
15	Pressure sensor output signal	16	Buzzer drive input
17	Steam sensor output signal	18	Converter reference voltage
19	Surface temperature output signal	20	Power on/off contact to latching circuitry
21	Door switch signal	22	Power on/off contact to latching circuitry
23	VENT drive input	24	Printer data signal
25	FILL drive input	26	DUMP drive input

P2 6 Pin Cable to T/P Module

1	24VDC
2	GND
3	5VDC
4	Pressure sensor signal
5	Steam sensor signal
6	Surface temp. signal

P3 Door Switch (Normally open contacts)

1	1Ω Pull down to gnd
2	+5VDC

P4 Printer Option

1	GND
2	+5VDC
3	Data Out

P5 Fill Solenoid

1	Fill solenoid (Pull down to gnd)
2	N/C
3	Fill solenoid (+28 VDC)

Table 8-1. (Cont.)

POWER BOARD (CONT.)

P6 Vent Solenoid

1	Vent solenoid (Pull down to gnd)
2	Vent solenoid (+28VDC)

P7 Dump Solenoid

1	Dump solenoid (+28VDC)
2	N/C
3	N/C
4	Dump solenoid (Pull down to gnd)

P8 (Not Present)

P9 AC Input

1	Line Neutral
2	Line Gnd
3	Line Hot

P10 Overheat Protector

1	Contact
2	Contact (Note: Overheat LED lit if overheat protector has opened.

P11 Heater Element

1	Heater element.
2	Heater element

P12 Triac Assembly

1	Heater element
2	Line neutral
3	Triac drive signal

Table 8-1. (Cont.)

MPU BOARD

P1 26 Pin Cable to Power Board: See pin list under power board.

TEMPERATURE/PRESSURE MODULE

P1 6 Pin Cable to Power Board: See pin list under power board.

P2 Steam Temperature Sensor

1	Base and collector leads
2	Emitter lead

P3 Surface Temperature Sensor

1	Sensor lead
2	N/C
3	Sensor lead

Table 8-2. PARTS CHECKING TABLE

(Resistance readings taken with Fluke Model 77 digital meter)

Steam sensor	4.2 M Ω in one direction, infinite resistance in other direction. (Readings very dependent on type of meter.)		
Surface temperature sensor	Cold resistance: (25 degrees C)	10	KΩ
	(100 degrees C)	7.932	KΩ
	(140 degrees C)	7.037	KΩ
Solenoid resistances (coils identical on all three)	64 Ω typ.		
Main heater resistance	Validator 8″ - 14 Ω typ. (120 VAC model) Validator 10″ - 10.5 Ω typ (120 VAC model)		
Current with heater fully on	7.5A typ.		
Triac resistance	between connector pins 2-3, 3-2	60 Ω typ.	
	between pins 1-2, 2-1, 1-3, 3-1	infinite resistance	

GLOSSARY

ASME:	American Society of Mechanical Engineers.
Asepsis:	Freedom from infective microorganisms.
Autoclave:	A container for sterilizing by steam under pressure.
Bioburden:	The level of organisms on a particular item at a specific time.
Biological Monitor or Spore Test:	A preparation of resistant microorganisms which is used to verify sterilization. Usually requires incubation which may be performed by an independent laboratory.
Cold Sterilant:	An agent which sterilizes at room temperature. Usually a chemical such as gluteraldehyde.
Corrosion Inhibitor:	A chemical substance which, when used in small amounts, effectively reduces the corrosion rate of metals such as carbon steel.
Demineralized Water:	Water which has the mineral matter removed.
Disinfection:	Destruction of bacteria.
Distilled Water:	Water which is purified through a heating and condensing process.
Iodophor:	A complex of iodine and an organic compound that releases iodine gradually and serves as a disinfectant.
Pathogen:	Any microorganism or virus that can cause disease.
Process Monitor:	An indicator which is sensitive to at least one sterilization parameter. Useful to indicate sterilization bypass but does NOT indicate sterilization. Examples: autoclave tape, heat–sensitive bag markings, heat sensitive marked strips, fusible glass melting pellets.
Sanitize:	To make an item surgically clean but not necessarily sterile. Usually accomplished using a low–level disinfectant.
Saturated Steam:	Steam which begins to condense to water if cooled even slightly. Saturated steam effectively transmits heat to instruments in the autoclave chamber.
Septic:	Unsterile. Infection caused by introduction of pathogenic microorganisms.
Spores:	The reproductive cell of some microorganisms which is highly resistant.
Sterilization:	Total destruction of all microbial life including bacteria, viruses and spores.
Ultrasound:	A type of cleaner which uses ultrasonic waves (high frequency sound) to agitate contaminants and dirt from items.
Vegetative Bacteria:	A freely multiplying form of bacteria.